Digital Equipment VAX-11 Series

VAX-11/730, /750, /780 & /782 Computer Systems

PROFILE

Operating Systems • VAX/VMS virtual memory operating system supporting concurrent timesharing, interactive, batch, and real-time processing • 32-bit system intended for scientific/engineering application at the high-end, and general data processing at the low end

Database • DBMS CODASYL-compliant database management system; Common Data Dictionary; DATATRIEVE interactive query and report generation • DSM implements ANSI MUMPS 1977 specification

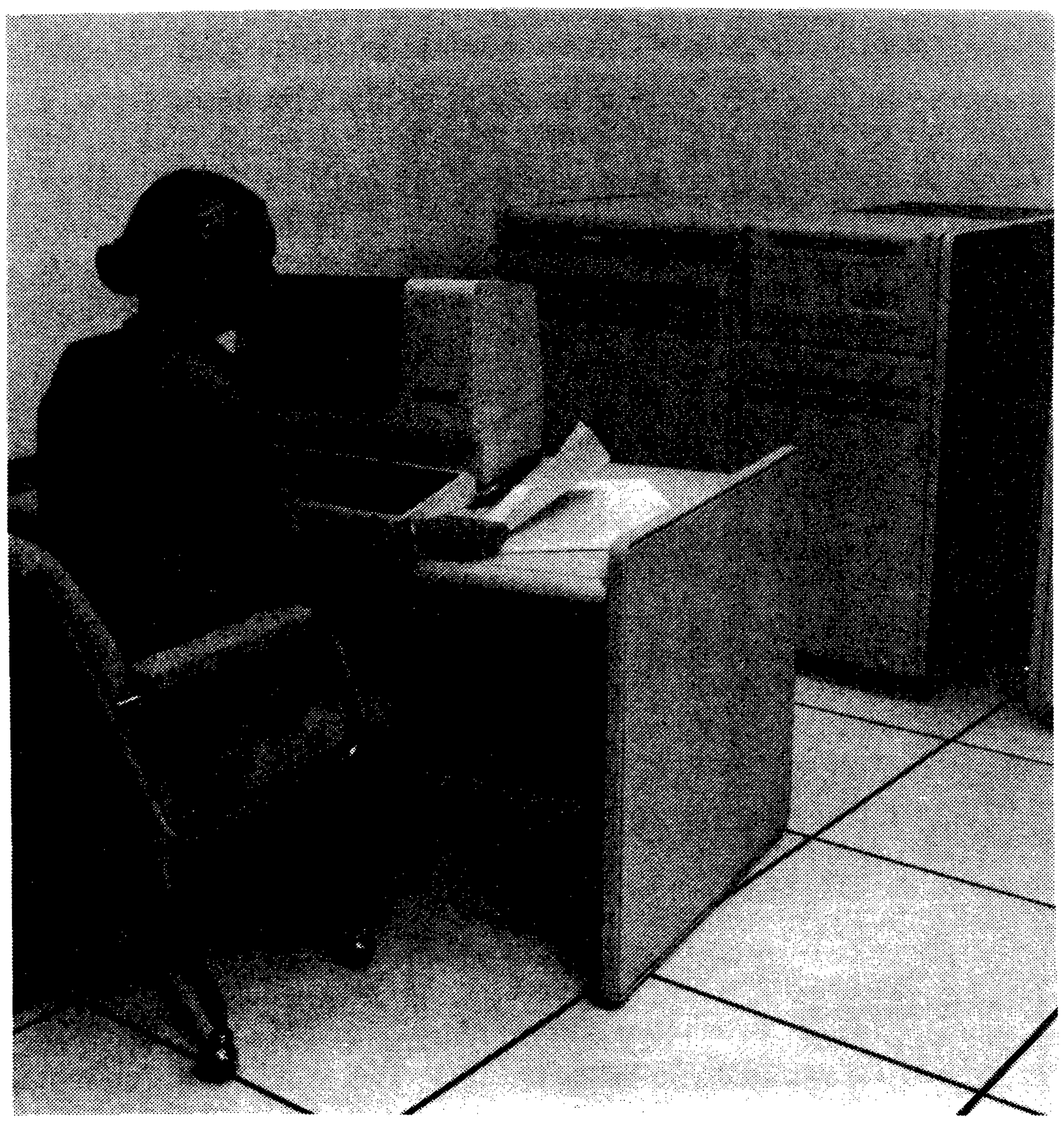
Communications/Networks • DNA (Digital Network Architecture) offers integrated set of networking capabilities; DECnet uses DDCMP protocol • Packetnet System Interface accommodates Public Packet-Switched Networks using X.25 and X.29 protocols • IBM 2780/3780/3271 and CDC MUX200 terminal emulation

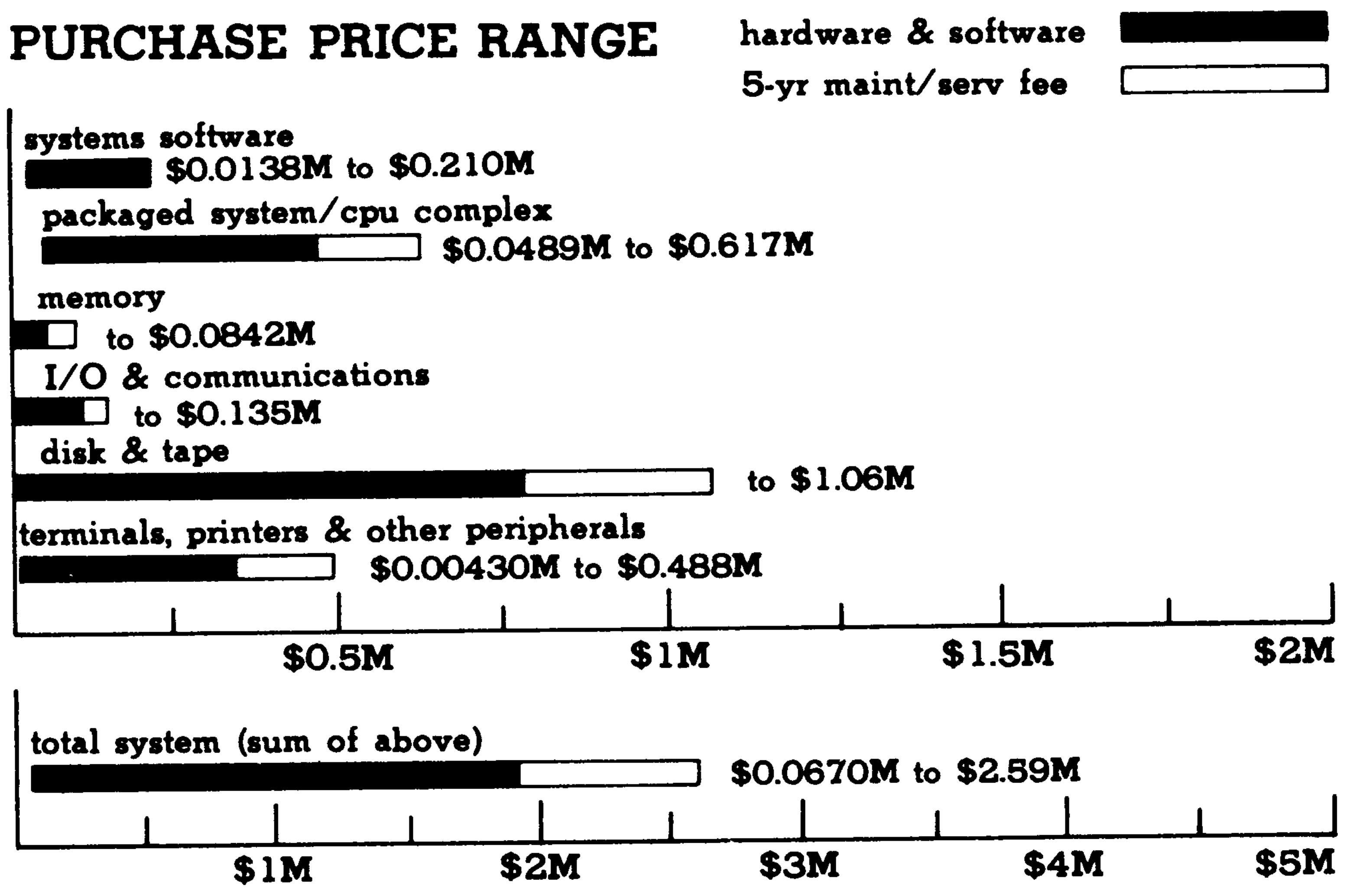
Languages • BASIC; BLISS 32; C; COBOL; CORAL 66; DIBOL; FORTRAN; Pascal; PL/1; MACRO Assembly

Models • VAX-11/730; VAX-11/750; VAX-11/780 • VAX-11/782 attached Processor System uses dual VAX-11/780 processors

Memory • 1M to 5M bytes on VAX-11/730; 512K to 8M bytes on VAX-11/750; 1M to 8M bytes on VAX-11/780 • 12M bytes maximum on VAX-11/780 using dual shared memory subsystems

Disk • 152.2M bytes maximum integrated disk storage on VAX-11/730; 12.384M bytes maximum on VAX-11/750; 16,512M bytes maximum on VAX-11/780 • 1M/41.6M/224M bytes maximum diskette/cartridge/cartridge subsystem storage options for UNIBUS connection





DIGITAL EQUIPMENT VAX-11 SERIES PURCHASE PRICING bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing, and open bars reflecting 5-year service/maintenance fees associated with large system • **SMALL SYSTEM** is based on VAX-11/730 **packaged system** (includes VAX/VMS operating system, CPU, 1M bytes main memory, 20M bytes disk storage, and LA120 console) and the following options: COBOL programming language **systems software**; and dual VT100 **terminals** • **LARGE SYSTEM** is based on VAX-11/780 **packaged system** (includes VAX/VMS operating system, CPU, 3M bytes main memory, 516M bytes disk storage, tape unit, 8-line asynchronous multiplexer, and LA120 console) and the following options: DBMS and other supporting **systems software**; additional 5M bytes **memory**; tri UNIBUS adapters, parallel interface, 8-line synchronous interface and 88 additional asynchronous lines **I/O & communications** facilities; additional 3616M bytes fixed-media and 2048M bytes removable-media **disk** storage; 8 **tape** units; 96 **terminals**; quad 1200-lpm **printers**; and dual 600-cpm card reader **peripherals**.

Terminals/Workstations • up to 24 on VAX-11/730; practical maximum of 32 on VAX-11/750; up to 96 on VAX-11/780 • VAX/VMS operating system supports up to 96 interactive users

Printers • 204- to 1200-lpm print speed options; 170- and 320-lpm printer/plotter print speeds

First Delivery • 1978 for VAX-11/780; 1980 for VAX-11/750; 1982 for VAX-11/730 and VAX-11/782

Systems Delivered • over 6,000

Comparable Systems • Data General MV family; Hewlett-Packard HP 3000; Honeywell DPS 7; IBM 4331/4341; Microdata SEQUEL; NCR I-9000 Series; Prime Series 50

Vendor • Digital Equipment Corporation; 146 Main Street, Maynard, MA 01754 • 617-897-5111

Distribution • direct sales/service offices in all major cities

ANALYSIS

The DEC VAX-11 consists of the 32-bit VAX-11/730, VAX-11/750, VAX-11/780, and VAX-11/782 models. The high-end VAX-11/780 is targeted towards scientific/engineering areas such as simulation and seismic processing. The VAX-11/782 attached processor system uses dual VAX-11/780 processors, particularly useful in compute-intensive environments.

The VAX-11/730 is approximately equal in performance to the 16-bit DEC PDP-11/44. Upwards-compatible with the larger

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VAX-11 processors, the VAX-11/730 is used for general data processing, timesharing, and real-time applications. It is effective as a node in a distributed processing network, or as a department-level host computer. Additionally, the VAX-11/730 apparantly is the bridge system between the 16-bit PDP-11 and the 32-bit VAX-11.

The VAX/VMS operating system runs on all systems. This virtual memory system provides a multifunction environment for real-time, timesharing, interactive and batch environments. It supports a 4.3G-byte virtual address space and a 2G-byte maximum program size. There can be up to 96 interactive users.

Simple files up to complex databases are accommodated. The RMS file management system is an integral part of the operating system. The VAX-11 DBMS database management system complies with the CODASYL proposed 1981 Working Document of the ANSI Data Definition Language Committee. DBMS accommodates more complex data handling requirements. DSM data management system implements ANSI MUMPS specification X11.1-1977.

DNA (Digital Network Architecture) offers an integrated set of networking capabilities. The DECnet networking system features task-to-task communications, network file transfer, network command terminals, and network resource sharing. Communications with other vendors' systems is accommodated using IBM 2780/3780/3271 and CDC MUX200 terminal emulation.

The more recent Packetnet System Interface enables users to communicate over Public Packet-Switched Networks using X.25 and X.29 protocols. It supports process-to-process and remote terminal communications.

BASIC, BLISS, C, COBOL, CORAL 66, DIBOL, FORTRAN, Pascal, and PL/1 programming languages are available for program development. Host development capabilities for the DEC PDP-11 consist of the Application Migration Executive and the MCR command language interpreter. The symbolic debugging utility can be used with all programming languages.

The 32-bit VAX architecture is implemented differently on the various processors. The VAX-11/730 uses Programmed Array Logic and LSI integrated circuits. The VAX-11/750 uses low-power bipolar Schottky circuit technology with LSI Gate Array implementation. The VAX-11/780 uses TTL Schottky circuit technology with MSI integrated circuit technology. The VAX-11/782 uses dual VAX-11/780 processors in an attached processor configuration.

The UNIBUS and MASSBUS I/O adapters are different for the VAX-11/750 and VAX-11/780. Other differences are that the VAX-11/780 accommodates a 32-bit parallel interface, shared memory, and memory interleaving. The VAX-11/730 does not accommodate MASSBUS adapters. All processors are instruction compatible with the DEC PDP-11 family using a compatibility mode.

A range of peripheral devices connect to the processors using UNIBUS and MASSBUS adapters. The asynchronous, bidirectional UNIBUS operates at 1.5M bytes per second on the VAX-11/730 and VAX-11/750, and at 1.3M bytes per second on the VAX-11/780. It is used for low-to-medium speed devices, including communications interfaces.

The MASSBUS is used for disk and magnetic tape equipment. It operates at 2M bytes per second and is available on the VAX-11/750 and VAX-11/780.

The DMF32 COMBO integrated controller on the VAX-11/730 consists of an 8-line asynchronous multiplexer, single synchronous line with modem control, and interface for line printer or customer-supplied device. Of the eight lines, six are used for locally connected terminals and two are used for remote communications. 50- to 19.2K-bps programmed communications rates are supported.

A current thrust is to expand the capabilities of the overall VAX-11 line. With the recently announced low-end VAX-11/730 and high-end VAX-11/782, the systems now span a sixfold range of processing power. It is expected that by offering additional capabilities, the market appeal of the VAX-11 line will be broadened significantly.

☐ Strengths

A major strength of the VAX-11 lies in the scope of its product offerings. The sixfold range in processing power, the use of a single operating system, the compatibility mode with the PDP-11, and DEC's corporate image makes the VAX-11 line a formidable competitor within its intended markets.

Extensive networking capabilities under the DNA (Digital Network Architecture) umbrella, coupled with the entry-level VAX-11/730 processor, should allow the VAX-11 product line to play a more active role within the commercial world of distributed processing.

☐ Limitations

The low-end VAX-11/730 is approximately equal to the 16-bit PDP-11/44 in floating-point, multiuser, and commercial performance. As such, choosing between them is not straightforward. Not having the lines of demarcation between the 32-bit and the 16-bit lines well defined leaves a user in somewhat of a quandry. Resolving this issue based merely on current software investment and potential applications growth, offers a rather unsatisfactory way of committing the user to a 16-bit or 32-bit architecture.

■ SOFTWARE

☐ Terms & Support

Terms • VAX/VMS usually bundled with system, unbundled for some OEMs; other software unbundled • source versions and/or listings available after the purchase of at least one supported license and after a source license agreement is in effect; full documentation and listings available; update service for documentation is available • VAX/VMS is Digital installed; all other software is customer installed.

Support • software is classified as Category A, B, or C; Category A support provides a 90-day warranty following installation during which defects in the software will be remedied on-site where necessary by temporary corrections or emergency bypass; for the remainder of the first year following installation, Category A remedial work will be handled by normal repair channels and updating will be provided; Category B support provides for normal repair service and maintenance only during the first year following installation; Category C software is provided on an as-is basis with all repair/maintenance work separately charged • service charges are included in license fee for software Categories A & B.

☐ Operating Systems

VAX/VMS Operating System

Operating Environment • virtual memory operating system supporting simultaneous timesharing, multistream, batch, and real-time processing • intended for general business data processing applications as a standalone system with multiple local/remote terminals or as part of a communications network; also targeted for scientific/technical/military processing • single operating system used on all VAX-11 models.

Resource Management • multiprogramming structure supports up to 96 interactive terminals • multistream batch facility accepts jobs from terminals, other batch jobs, programs, or card decks; number of batch jobs running concurrently is operator controlled • 16 real-time priority levels; provides compatibility with DEC PDP-11 systems • event-driven priority scheduling; priviledge and resource allocation user controlled; pre-emptive priority scheduling of CPU time and memory residency is system manager or priviledge user controlled • single copy controls Associated Processor in VAX-11/782 configurations.

Virtual Memory • 4.3G bytes virtual address space; 2G bytes maximum program size • provides dynamic virtual memory resource management • virtual memory paging and execution priority is operator controlled in real-time applications.

Program Processing • handles concurrent multiuser timesharing, multiprogramming batch, and online interactive programs; extensive online support for program development •

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common runtime environment; consists of an interface to the Common Run Time Library.

Data Management • includes VAX-11 DBMS CODASYL-compliant database management system; accessed using VAX-11 DATATRIEVE or through applications programs; VAX-11 Common Data Dictionary integrates DBMS and DATATRIEVE using a single set of data descriptions • DSM data management system implements ANSI MUMPS Specification X11.1-1977 • RMS provides general file and record management system; up to 255 identifying keys for each record • general-purpose SORT/MERGE facility.

Communications Support • DECnet networking architecture; offers task-to-task communications, network file transfer, network command terminals, and network resource sharing • IBM 2780/3780/3271 and CDC MUX200 terminal emulation.

Programming Support • accommodates BASIC, BLISS 32, C, COBOL, CORAL 66, DIBOL, FORTRAN, Pascal, PL/1, and MACRO programming languages • interactive and batch text editors; symbolic debugger; analyzer utilities for examining object files/disk structures/system dumps • FMS forms management system provides screen formatting capabilities • provides DEC PDP-11 host development capabilities; consists of RSX-11M operating system, AME (Application Migration Executive), the MCR command language interpreter, and PDP-11 language processors.

User Interface • DCL command language interpreter is used for interactive and batch applications; provides a HELP facility • includes computer-aided instruction course for introducing basic functionality.

QX001 VAX/VMS Operating System • includes operating system nucleus, virtual memory manager, swapper, system services, I/O device drivers, user authorization control program, job initiator and symbiont manager, account manager, operator communications manager, error logging and print utility, DCL and MCR command interpreters, interactive and batch editors, macro assembler, linker with cross reference, library maintenance utility, common runtime procedure library, symbolic debugger for native programs, record management services, SORT/MERGE utility, user environment test package, and software maintenance release update utility:

$20,000 lcns

☐ Data Management

QX899 VAX-11 DBMS • database management system complies with the CODASYL ANSI Data Definition Language Committee's March 1981 Working Document • requires Common Data Dictionary:

$30,000 lcns

QX897 VAX-11 Common Data Dictionary • provides central repository for data definitions • prerequisite for DBMS and DATATRIEVE packages:

3,000

QX898 DATATRIEVE • interactive query, report, and data management system; runs in PDP-11 compatibility mode utilizing RMS-11 records management files • supports sequential, indexed, or relative data organization, variable length records, and single inquiry access to multiple files • unsophisticated, simple data manipulation commands selectively retrieve data and sort, select, print, modify, erase, edit, format, update, and generate reports; user can define logical records comprising multiple RMS-11 files; supports variable length records; complex commands such as Repeat, Begin, End, If-Then-Else can be combined into compound commands to be executed directly or stored in the Data Dictionary as procedures; includes full set of arithmetic and statistical operators • Data Dictionary stores record format and domain/file definitions plus frequently used command sequences/procedures; dictionary compression utility available to clean up the Data Dictionary index file • access control is via the Data Dictionary to individual entries • language interfaces to FORTRAN, COBOL, and BASICPLUS-2 are provided • Report Writer provides commands to control report name, data pagination, page width/length, detail line breaks, general control breaks plus subtotals, and multiple report sections • runs on any valid VAX/VMS configuration; Support Category A:

15,000

QX130 VAX-11 DSM • consists of multiuser data management system with Digital Standard MUMPS (DSM) language interpreter; reentrant interpreter implements superset of ANSI MUMPS specification X11.1-1977 • runs under VMS operating system • Support Category A:

12,000

VAX-11 RMS (Record Management Services) • a collection of procedures that provide facilities for data storage, retrieval, and modification; run in compatibility mode; relative, sequential, and multikey indexed-sequential (ISAM) data organization; user programs are given logical data record access to files through extended syntax program statements or function calls that contain key field values associated with individual logical data records; runtime service routines provide an interface between VAX/VMS and PDP-11 multiprogrammed operating systems and user-developed application programs; utility programs enable definition, creation, maintenance of data files; access control is via record locking; multivolume file capability included • runs on any valid VAX/VMS system plus an additional 4K bytes; Support Category A; included with VAX/VMS.

☐ Communications/Networks

DECnet is a family of products DEC supplies to allow Digital's computers and operating systems to be linked together into networks. Digital Network Architecture (DNA) provides the structure under which DECnet operates. DNA consists of the user level, network service level, data link level, and physical link level. The user level provides modules to access remote files, transfer remote files, and load systems. The protocol governing remote file access and transfer is the Data Access Protocol (DAP).

The network services level provides a facility for user levels to communicate by means of logical links without concern over the physical location. The protocol used between network service modules is called the Network Services Protocol (NSP).

The data link level provides error-free communication between adjacent network nodes. This level uses the Digital Data Communications Message Protocol (DDCMP). The physical link level provides the communication devices to transmit information between nodes.

DEC supplies facilities for users to build communication, resource sharing, and distributed computing networks. When DECnet connects heterogeneous systems together, native mode programs can use the following network services: interprocess communication, intersystem file transfer, intersystem resource sharing, network command terminal, downline system loading, and downline command file loading. In addition, DEC supplies emulators to allow internal communication with foreign networks.

QXD03 DECnet-VAX • operates as an Ancillary Control Process (ACP) under VAX/VMS and enables the user to build networks for distributed data processing using asynchronous, synchronous, and parallel facilities; offers task-to-task communications, network file transfer, remote file access using RMS, remote computer access from local terminal network resource sharing using Digital Network Architecture (DNA) protocols • networks can include multiple DECnet-VAX systems as well as DECnet nodes consisting of other DEC equipment; Network Control Program (NCP) utility displays statistics and controls/tests network components • requires a valid VAX/VMS system with 1 communications line supported by a DMC11 synchronous interface; supports user programs written in VAX-11, MACRO, or FORTRAN IV-PLUS; Support Category A:

$5,000 lcns

QX071 VAX-11 PSI • Packetnet System Interface; connects to Public Packet Switching Networks conforming to CCITT recommendation X.25 • supports process-to-process and remote

LCNS: one-time license fee; includes service. Prices effective as of April 1982.

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terminal communications:

5,000

QX070 MUX 200/VAX Multiterminal Emulator • allows any VAX-11 interactive terminal to control remote job entry or to communicate at command level with the host system; files may be transferred to/from any VAX-11 supported mass storage, unit record, or terminal device; host system may off-load programs such as file editing to local processing on VAX/VMS system • requires valid VAX/VMS configuration with a DUP11 synchronous communication interface; supports up to 16 simultaneous users over a single physical drop on a switched or dedicated leased 2- or 4-wire common carrier facility at up to 9600 bps; communicates with a CDC 6000 CYBER series or other host computer systems capable of using 200 UT Mode 4A communications protocol in either ASCII or BCD; Support Category A:

8,100

QX111 VAX-11 2780/3780 Protocol Emulator • facilitates sharing of a communication line among several users; allows VAX/VMS user to transfer files to/from another system equipped to handle 2780 or 3780 communications protocols; with appropriate modem options automatically answers incoming calls; command procedures can be combined to form sophisticated control sequences • requires valid VAX/VMS configuration plus a DUP-11; supports a maximum of 4 physical lines, each with a different set of attributes at up to 9600 bps per line; emulates the synchronous line protocol used by a 2780 or 3780 batch terminal; Support Category A:

6,400

QX112 VAX-11 3271 Protocol Emulator • enables user programs to communicate interactively with user programs running on an IBM System/370 (including 303X processor) systems • communications discipline is the 3271 subset of IBM's Binary Synchronous Communications (BSC) protocol using EBCDIC code • requires valid VAX/VMS configuration with a DUP-11 synchronous communication interface; Support Category A:

7,500

☐ Program Development/Languages

VAX-11 MACRO • bundled with VAX/VMS operating system; similar to PDP-11 MACRO, but corresponds to VAX native mode instructions; provides support for user-defined macros and includes multiple macro libraries.

QX100 VAX-11 FORTRAN • superset of FORTRAN-77, fully conforming to ANSI standards; optimizing compiler capable of speeds of 2000 to 3,000 lpm; upward compatible with older versions of FORTRAN; language extensions over VAX-11 FORTRAN IV-PLUS include access to VAX RMS multikey ISAM (indexed) file, enabling use of the language for file maintenance applications; recognizes extended LOGICAL, INTEGER, and COMPLEX data types; special statements extend user control of file organization and access and simplify I/O data formats • Support Category A:

$8,700 lcns

QX101 VAX-11 COBOL-74 • based on the American National Standards (ANSI) COBOL, X3.23-1974; operates under VAX/VMS and takes advantage of the packed decimal (COMP-3) and character string instruction set and virtual memory; meets ANS-74 low-level specificaitons with the following extensions: Full Level 2 Modules for Nucleus, Table Handling, sequential I/O, Relative I/O, Indexed I/O, and Segmentation; Full Level 1 Modules with the Library and Interprogram Communications; Cross Reference Compilation Listing and DISPLAY with NO ADVANCING; not included is the RERUN option with I/O-CONTROL • Support Category A:

13,800

QX099 VAX-11 COBOL Enhanced • high-performance implementation of ANSI COBOL 1974 incorporating features for the next ANSI Standard of COBOL, expected in 1981; provides full support of COBOL modules—nucleus, table handling, and interprogram communication; maximum compile speed of 3000 lpm; numeric display and computation data types, signed/unsigned packed decimal, floating-point and alphanumeric display data; source language listings are produced with embedded diagnostics that indicate the line number and position of errors • Support Category A:

13,800

QX015 VAX-11 C • implements the C programming language described by Kernigan and Ritchie at Bell Labs • up to 3000-lpm compilation speeds:

7,500

QX106 VAX-11 BLISS-32 • high-level systems implementation language that supports development of modular software according to structured programming concepts; provides access to most of the hardware features of the VAX-11 to facilitate programming of time-critical and/or hardware-dependent applications; intended for the development of operating systems, compilers, runtime system components, database file systems, communications software, and utilities; runs in native mode under VAX/VMS; translates BLISS-32 source programs into relocatable object modules that can be linked for execution; compiler performance varies with the virtual memory working set allowed for it; in typical large-scale compilation of complex programs, a working set allocation of over 300 pages (150K bytes) may be desirable for efficient system utilization; a VAX/VMS system with 512K bytes of memory is needed • Support Category A:

13,800

QX095 VAX-11 BASIC • high-performance extension of existing DEC BASIC; compilation speed of up to 3000 lpm and execution speed comparable to VAX-11 FORTRAN; possesses extensive I/O, character, and matrix handling facilities for a wide variety of technical, commercial, and educational applications; immediate execution mode for efficient program development; integrated HELP facility and powerful applications-related utilities • Support Category A:

9,200

QX110 VAX-11 PASCAL • extended implementation of the PASCAL language • utilizes the VAX-11 hardware floating-point and character instruction sets and virtual memory; consists of a reentrant, native mode compiler suitable to instructional systems programming and research applications; consists of a structured high-level programming language • extensions include: DOUBLE precision real data type (16 digits precision); sets of up to 256 elements; dynamic sizing of formal array parameters; 15-character identifiers; exponentiation operator; OPEN and CLOSE I/O procedures; FIND I/O procedure • Support Category B:

5,500

QX067 VAX-11 CORAL 66 • native VAX language version of CORAL 66; allows block structuring of programs and utilizes integer, real, byte, and character string data types • Support Category A:

10,000

QX114 VAX-11 PL/1 • native VAX language extension of ANSI X3.74 PL/1 general-purpose subset; compilation speed is 2000 to 3000 lpm; generated code efficiency comparable to VAX-11 FORTRAN object; extensions provide file organization and access support for calls to VAX/VMS for services, such as SORT, Librarian, and Forms Management System (FMS); can call routines written in any VAX-11 language and vice-versa; can use common VAX-11 math and trig functions • Support Category A:

13,800

☐ Program/Applications Development Aids

QX701 FMS • screen-formatting forms management system; utilities and subroutines support applications programs written in different programming languages • intended for use with VT100 display:

$5,180 lcns

☐ Office Automation

QX400 VAX-11 DECMAIL • standalone, single-node mail

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and filing system ● creates, edits, sends, and processes messages on a single system:

$20,000 lcns

QX707 DX/VMS ● word processing utility connects a WPS-8 word processing system to a host VMS system ● accommodates WPS-8, WPS-8/78, and WPS-8/MTS software:

2,900

☐ Other Facilities

ZE014 VAX-11/780 Diagnostic Extended ● set of micro-diagnostics programs that allow the user to enhance the self-maintenance of the system; detects faults at the micro level, with isolation to a single module or 1 of 2 modules; runs in the VAX-11/780 LSI-11 console ● Support Category A:

$1,150 lcns

QX051 VAX-11 Pen Plotter Utilities ● consists of a library of FORTRAN subroutines for supporting CALCOMP pen plotters ● runs under VAX/VMS operating system; Support Category C:

2,500

QX055 VAX-11 Digitizer Utilities ● consists of a library of FORTRAN subroutines for supporting TALOS digitizer tablets ● runs under VAX/VMS operating system; Support Category C:

2,500

QE053 VAX-11 Engineering Drawing Utilities ● consists of a library of FORTRAN subroutines for controlling plotting devices ● runs under VAX/VMS operating system; Support Category C:

2,750

QX118 VAX-11 RGL ● ReGIS Graphics Library subroutines; used with VT125 terminal:

6,000

■ HARDWARE

☐ Terms & Support

Terms ● DEC offers the VAX-11 on a purchase basis with a separate, monthly maintenance charge; a lease/purchase agreement can be established through an arrangement between DEC and the U.S. Leasing Corporation to provide for monthly payments ● DEC charges installation fee for add-ons.

Support ● Field Service offers DEC service and Basic Service agreements; both are for 8 hours per day, 5 days per week; both can be extended to 12, 16, or 24 hours per day, 7 days per week ● either service can make use of Remote Diagnosis service at any hour or day at no extra charge; requires direct-dial telephone line and RJ11-C voice-grade jack in U.S. or Bell 103-type full-duplex, low-speed modem in Canada and Europe; typical response is 10 minutes ● DEC service agreement commits DEC to respond to customer call within 4 hours for customers located within 100 miles of a field service office; remedial work continues until repaired; includes scheduled preventive maintenance and installing engineering changes to keep system at current revision level ● Basic Service agreement typically provides next day response, but otherwise the same as DEC service agreement; these are the maintenance figures shown with price data in this report.

☐ Systems Overview

The 32-bit VAX series consists of the VAX-11/730, VAX-11/750, VAX-11/780, and VAX-11/782. The high-end VAX-11/782 is an attached processor system using dual VAX-11/780 processors. As such, it offers 1.6 to 1.8 times the performance of the VAX-11/780.

The UNIBUS and MASSBUS I/O adapters are different for the VAX-11/750 and VAX-11/780. The VAX-11/730 does not accommodate MASSBUS adapters. The VAX-11/780 accommodates the DR780 32-bit parallel interface. All processors are compatible with the DEC PDP-11 family through the compatibility mode.

System maximums are as follows:

VAX-11/730 Maximums ● 1M to 5M bytes memory ● 4.3G bytes logical address space; 2G bytes user program space ● single UNIBUS; 1.5M-byte-per-second throughput ● up to 24 terminals.

VAX-11/750 Maximums ● 512K to 8M bytes memory ● 4.3G bytes logical address space; 2G bytes user program space ● dual UNIBUS and tri MASSBUS adapters; quad adapters total; 7.5M-byte-per-second throughput ● practical maximum of 32 terminals.

VAX-11/780 Maximums ● 1M to 8M bytes memory; 12M bytes using dual shared memory subsystems ● 4.3G bytes logical address space; 20 bytes user program space ● quad UNIBUS and quad MASSBUS adapters with 13.4M-byte-per-second aggregate throughput; single 32-bit parallel interface ● up to 96 terminals.

☐ Packaged Systems

VAX-11/730 Systems

SV-CXMMA Package ● consists of VAX-11/730 CPU, VAX/VMS operating system, 1M bytes memory, 20M bytes disk storage, and LA120 console printer terminal:

$48,900 prch $342 maint

SV-CXWMA Package ● same as SV-CXMMA with 131M bytes disk storage:

59,400 363

VAX-11/750 Systems

SV-BXHHA Package ● consists of VAX-11/750 CPU, VAX/VMS operating system, 512K bytes memory, 56M bytes disk storage, 8-line asynchronous multiplexer, and LA38 console printer terminal:

$92,600 prch $600 maint

SV-BXTAA Package ● same as SV-BXHHA with 1M bytes memory, 67M bytes disk storage, and tape unit (45 ips; 1600 bpi):

128,800 674

SV-BXDBA Package ● same as SV-BXHHA with 3M bytes memory, 256M bytes disk storage, and tape unit (45 ips; 800/1600 bpi):

160,000 872

SV-BXWAA Package ● same as SV-BXHHA with 1M bytes memory, 124M bytes disk storage, and tape unit (45 ips; 1600 bpi):

123,600 627

SV-BXWVA Package ● same as SV-BXHHA with 1M bytes memory, 124M bytes disk storage, and tape unit (45 ips; 800/1600 bpi):

130,000 728

SV-BXWBA Package ● same as SV-BXHHA with 1M bytes memory, 124M bytes disk storage, and tape unit (125 ips; 800/1600 bpi):

140,000 788

VAX-11/780 Systems

SV-AXTVC Package ● consists of VAX-11/780 CPU, VAX/VMS operating system, 1M bytes memory, 67M bytes disk storage, tape unit (45 ips; 800/1600 bpi), 8-line asynchronous multiplexer, and LA120 console printer terminals:

$219,100 prch $958 maint

SV-AXTBB Package ● same as SV-AXTVC with tape unit (125 ips; 800/1600 bpi):

239,200 1,099

SV-AXDBC Package ● same as SV-AXTVC with 2M bytes memory, 256M bytes disk storage, and tape unit (125 ips;

PRCH: purchase price. MAINT: monthly maintenance charge for Basic Service. NA: not applicable. Prices effective as of April 1982.

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800/1600 bpi):

274,900 1,349

SV-AXDCA Package • same as SV-AXTVC with 2M bytes memory, 256M bytes disk storage, and tape unit (125 ips; 1600/6250 bpi):

296,700 1,514

SV-AXWBB Package • same as SV-AXTVC with 2M bytes memory, 124M bytes disk storage, and tape unit (125 ips; 800/1600 bpi):

243,900 1,121

SV-AXCBC Package • same as SV-AXTVC with 2M bytes memory, 176M bytes disk storage, and tape unit (125 ips; 800/1600 bpi):

274,900 1,270

SV-AXVCA Package • same as SV-AXTVC with 2M bytes memory, 516M bytes disk storage, and tape unit (125 ips; 1600/6250 bpi):

300,000 1,441

SV-AXVCB Package • same as SV-AXTVC with 3M bytes memory, 516M bytes disk storage, and tape unit (125 ips; 1600/6250 bpi):

341,600 1,556

VAX-11/782 Systems

SV-AADCA Package • consists of dual VAX-11/780 CPUs, VAX/VMS operating system, 2M bytes memory, 256M bytes disk storage, tape unit, 8-line asynchronous multiplexer, and dual LA120 console printer terminals:

$430,000 prch $2,354 maint

SV-AAWCA Package • same as SV-AADCA with 124M bytes disk storage:

395,000 2,126

SV-AAVCA Package • same as SV-AADCA with 3M bytes memory and 516M bytes storage:

445,000 2,394

DECmail Systems

DTBXX Packages • consists of VT100W terminals and fully-supported DECmail software.

DTB04-BA • for VAX-11/780; includes 4 terminals:

$28,180 prch $84 maint

DTB04-AA • for VAX-11/750; includes 4 terminals:

28,180 84

DTB08-BA • for VAX-11/780; includes 8 terminals:

35,224 168

DTB08-AA • for VAX-11/750; includes 8 terminals:

35,224 168

DTB16-BA • for VAX-11/780; includes 16 terminals:

49,312 336

DTB16-AA • for VAX-11/750; includes 16 terminals:

49,312 336

DTB32-BA • for VAX-11/780; includes 32 terminals:

77,440 672

DTB32-AA • for VAX-11/750; includes 32 terminals:

77,440 672

DTB96-BA • for VAX-11/780; includes 96 terminals:

183,680 2,016

DTB96-AA • for VAX-11/750; includes 96 terminals:

183,680 2,016

☐ CPU

VAX-11/730 CPU • 32-bit, microprogrammed architecture • uses bit-slice and PAL (Programmed Array Logic) technology; LSI integrated circuits implementation • 16 32-bit registers • executes VAX instruction set in native mode; DEC PDP-11 non-priviledged instructions in compatibility mode • optional floating-point accelerator • console consists of front panel, dual cartridge tape drives, console terminal, and remote access port.

VAX-11/750 CPU • 32-bit, microprogrammed architecture • uses low-power bipolar Schottky technology; LSI gate arrays implementation • 16 32-bit registers • executes VAX instruction set in native mode; DEC PDP-11 non-priviledged instructions in compatibility mode • 4K bytes cache memory; 20K bytes user control store • optional floating-point accelerator • console consists of front panel, cartridge tape drive, console terminal and remote diagnosis module.

VAX-11/780 CPU • 32-bit, microprogrammed architecture • uses TTL Schottky technology; MSI integrated circuits implementation • 16 32-bit registers • executes VAX instruction set in native mode; DEC PDP-11 non-priviledged instructions in compatibility mode • 8K bytes cache memory; 24K bytes user control store • optional floating-point accelerator • console consists of LSI-11 with 16K bytes memory and 8K bytes ROM, diskette drive, hard copy terminal, and remote diagnosis port.

VAX-11/782 CPU • uses dual VAX-11/780 CPUs • offers 1.6 to 1.8 times the performance of the VAX-11/780.

FP730 Floating-Point Accelerator • for VAX-11/730:

$3,995 prch $25 maint

FP750 Floating-Point Accelerator • for VAX-11/750:

8,500 45

FP780 Floating-Point Accelerator • for VAX-11/780:

11,200 50

FP782 Floating-Point Accelerators • dual accelerators for VAX-11/782:

22,400 96

KU750 User Writable Control Store • for VAX-11/750 • 1K 88-bit words:

6,000 47

KU780 User Writable Control Store • for VAX-11/780 • 2K 99-bit words:

11,000 53

☐ Memory

VAX-11/730 Memory

MS730-CA Module • 1M bytes ECC module; 64K-bit chips:

$9,000 prch $29 maint

MS730-CB Module • 2M bytes ECC module; 64K-bit chips:

16,000 58

MS730-CC Module • 3M bytes ECC module; 64K-bit chips:

21,000 116

MS730-CD Module • 4M bytes ECC module; 64K-bit chips:

24,000 232

VAX-11/750 Memory

MS750-DA Subsystem • 1M bytes ECC memory with controller • handles memory in 64K arrays:

$13,000 prch $29 maint

MS750-CA Module • 1M bytes ECC memory; single 64K array:

9,000 29

MS750-CB Module • 2M bytes ECC memory in 64K arrays:

16,000 58

MS750-CC Module • 3M bytes ECC memory in 64K arrays:

21,000 87

MS750-CD Module • 4M bytes ECC memory in 64K arrays:

24,000 116

MS750-AA Module • 256K bytes ECC memory:

2,400 61

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MS750-AB Module • 512K bytes ECC memory:
4,000 103

MS750-AC Module • 1M bytes ECC memory:
7,000 179

H7112 Battery Backup • provides memory power for up to 10 minutes:
1,800 12

VAX-11/780 Memory

MS780-CC Module • 512K bytes ECC module with controller:
$26,600 prch $166 maint

MS780-DA Module • 256K bytes ECC expansion module:
2,400 61

MS780-DB Module • 512K bytes ECC expansion module:
4,000 103

MS780-DC Module • 1M bytes ECC expansion module:
7,000 179

MS780-DD Module • 2M bytes ECC expansion module:
13,000 294

MS780-DE Module • 4M bytes ECC expansion module:
18,000 380

H7112-A Battery Backup • provides up to 10 minutes of memory power:
1,800 12

Shared Memory

MA780 Multiport Memory • bank of MOS semiconductor memory with Error Correcting Code (ECC); can be shared by up to 4 VAX-11/780 systems via MA780-C port interface; each MA780 can be expanded from 256K bytes to 2M bytes; system supports 2 MA780 banks; provides up to 11M-byte-per-second total throughput • H7112 battery backup option available for shared memory; maintains power of shared memory (2M bytes) for 10 minutes.

MA780-A • basic 256K-byte ECC MOS Multiport Memory Subsystem • includes controller, 2 MA780-C port interfaces, cabinet:
$39,500 prch $188 maint

MA780-B • additional 256K bytes of MA780 Multiport Memory:
34,600 188

MA780-E • interface for third or fourth VAX-11/780 CPU connected to MA780:
39,500 188

MA780-D • selective cache invalidate option for 3- and 4-processor system; keeps track of shared memory locations accessed by each CPU; when a location is written into, this option notifies the affected CPUs so they can purge cache:
9,000 61

☐ I/O

Peripheral devices connect using UNIBUS and MASSBUS adapters. The asynchronous, bidirectional UNIBUS is used for low- to medium-speed devices, including communications interfaces. The MASSBUS is used for disk and magnetic tape equipment. In addition, the VAX-11/780 and VAX-11/782 accommodate the general-purpose DR780 parallel interface.

VAX-11 I/O

VAX-11/730 I/O • consists of integral UNIBUS adapter, and integrated DMF32 Communications and Disk Controllers; 1.5M-byte-per-second maximum UNIBUX throughput • DMF32 consists of 8-line asynchronous multiplexer, single synchronous line with modem control, and interface for line printer or customer-supplied devices • disk interface controls up to 4 disk drives • included in packaged systems.

VAX-11/750 I/O • consists of up to 2 UNIBUS and up to 3 MASSBUS adapters; up to 4 adapters total • 1.5M-/2M-byte-per-second maximum UNIBUS/MASSBUS throughput • single UNIBUS adapter included in packaged systems; MASSBUS adapters included in disk/tape subsystems.

DW750 UNIBUS Adapter • provides second UNIBUS adapter for VAX-11/750:
$12,900 prch $39 maint

VAX-11/780 I/O • consists of up to 4 UNIBUS and up to 4 MASSBUS adapters, and single DR780 parallel interface • 1.35M-/2M-byte-per-second maximum UNIBUS/MASSBUS throughput; 32-bit parallel interface connects to Memory Interconnect system bus • single UNIBUS adapter included in packaged systems; MASSBUS adapters included in disk/tape subsystems.

VAX-11/782 I/O • same as VAX-11/780 except for DR780 interface • second processor not used for I/O operations.

DW780 UNIBUS Adapter • optional UNIBUS adapter for VAX-11/780 and VAX-11/782:
12,900 39

DR780 Parallel Interface • for VAX-11/780 • up to 6.67M-byte-per-second transfer rate; synchronous 32-bit parallel interface:
18,700 88

General-Purpose I/O Controllers & Interfaces

DMF32 COMBO • consists of 3 DMA controllers: 8-line asynchronous multiplexer, single synchronous line, and line printer interface • alternatively, line printer interface serves as a parallel interface for connecting customer-supplied devices • single unit included in VAX-11/730 packaged systems:
$3,995 prch $55 maint

DR11-W Interface • interfaces user devices to UNIBUS adapter:
1,650 11

☐ Communications

DMF32 Asynchronous Multiplexer • 8 lines • 2 lines support modems; 50-bps to 19.2K-bps programmed communications rates • 6 lines connect local terminals • included in DMF32 COMBO.

DMF32 Synchronous Line • single line for DECnet connections • included in DMF32 COMBO.

KMS11-BD Synchronous Interface • 8-line front-end for VAX-11/780; requires VAX-11 PSI software • ADCCP, HDLC, and IBM 3271 bisynchronous protocols; RS-232C, MIL-188-144 unbalanced, and V.24 electrical interfaces:
$12,500 prch $97 maint

DZ11 Asynchronous Multiplexer • programmable speeds up to 9600 bps with local EIA terminals, up to 300 bps using Bell 103 or 113 modems, or up to 1200 bps using Bell 212 modems • formats on a per-line basis; provides control for up to 16 local asynchronous terminal devices or 16 half- or full-duplex lines; includes 64-character input buffer; includes parity generation/check on data.

DZ11-A • supports EIA/CCITT interfaces; used with Bell 103 or 113 modems; 8 lines expandable to 16:
2,700 33

DZ11-B • 8-line expansion for DZ11-A:
2,150 28

DZ11-C • 20 mA current loop; supports 8 lines:
3,000 33

DZ11-D • 8-line expansion for DZ11-C:
2,310 28

DZ11-E • supports EIA/CCITT; supports 16 lines:
4,350 56

DZ11-F • 20 mA current loop; supports 16 lines:
5,000 56

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DMR11 Single Line Synchronous Interface • DDCMP microprocessor and line unit module; provides connection to another DMR11 using cable or common carrier facilities; half- or full-duplex; available in 4 comm standards: EIA RS-232C/CCITT V.24 and EIA RS423/CCITT V.24, local coaxial version, CCITT V.35 and EIA RS422/CCITT V.24.

DMR11-AA • interfaces to EIA RS-232C/CCITT V.24 synchronous modems (Bell Series 200); also interfaces to EIA RS423/CCITT V.24 synchronous modems (requires cable not supplied by DEC); speed up to 19,200 bps; half-/full-duplex:

4,400 39

DMR11-AC • uses twinaxial, coaxial, or triaxial cable up to 18,000 feet long for local connection; switch selectable speed of 56,000, 250,000, 500,000, or 1M bps depending on cable length • requires 2 Hex slots:

4,400 39

DUP-11 Synchronous Interface • half-/full-duplex; programmable for 8-bit character-oriented protocols and bit-oriented at up to 9600 bps • requires VAX-11 2780/3780 Protocol Emulator for MUX200/VAX:

1,575 12

□ Disk

Integrated Disk Controller • 152.2M bytes maximum subsystem storage • up to 4 RL02 drives with 10.4M bytes each; alternatively, up to 3 RL02 drives and single 121M-byte drive • included in VAX-11/730 packaged systems.

RX211 Diskette Subsystem • 1M bytes storage • consists of UNIBUS controller and dual diskette drives • 512K bytes per drive; 55K-byte-per-second peak transfer rate; 263-millisecond average access time:

$4,150 prch $50 maint

RK711 Cartridge Disk Subsystem • 224M bytes maximum subsystem storage; up to 8 drives of 28M bytes each • 49-millisecond average access time; 538K-byte-per-second peak transfer rate • connects to UNIBUS adapter.

RK711-EA Subsystem • consists of controller and single drive:

18,500 161

RK711-FA Subsystem • consists of dual controllers and single drive:

25,500 210

RK07-EA Drive • 28M-byte single-access add-on drive:

13,000 127

RK07-FA Drive • 28M-byte dual-access add-on drive:

16,800 144

RL211-AK Cartridge Disk Subsystem • 41.6M bytes maximum subsystem storage; up to 4 drives of 10.4M bytes each • 67.5-millisecond average access time; 512K-byte-per-second peak transfer rate • consists of controller and single drive; connects to UNIBUS adapter:

6,900 71

RL02 Drive • 10.4M-byte add-on drive:

3,000 63

RM03 Removable Disk Subsystem • 536M bytes maximum subsystem storage; up to 8 drives of 67M bytes each • 38.3-millisecond average access time; 1.2M-byte-per-second peak transfer rate • connects to MASSBUS adapter.

RGM03-AA Subsystem • for VAX-11/750 • consists of MASSBUS adapter and single drive:

32,300 188

RGM03-BA Subsystem • for VAX-11/750 • consists of dual MASSBUS adapters and single drive:

43,900 237

REM03-AA Subsystem • for VAX-11/780 • consists of MASSBUS adapter and single drive:

32,300 188

REM03-BA Subsystem • for VAX-11/780 • consists of dual MASSBUS adapters and single drive:

43,900 237

RM03-AA Drive • 67M-byte single-access add-on drive:

20,300 154

RM03-BA Drive • 67M-byte dual-access add-on drive:

22,500 171

RP06 Removable Disk Subsystem • 1408M bytes maximum subsystem storage; up to 8 drives of 176M bytes each; 38.3-millisecond average access time; 806K-byte-per-second peak transfer rate • connects to MASSBUS adapter.

RGP06-AA Subsystem • for VAX-11/750 • consists of MASSBUS adapter and single drive:

46,000 243

RGP06-BA Subsystem • for VAX-11/750 • consists of dual MASSBUS adapters and single drive:

60,600 298

REP06-AA Subsystem • for VAX-11/780 • consists of MASSBUS adapter and single drive:

46,000 243

REP06-BA Subsystem • for VAX-11/780 • consists of dual MASSBUS adapters and single drive:

60,600 298

RP06-AA Drive • 176M-byte single-access add-on drive:

34,000 210

RP06-BA Drive • 176M-byte dual-access add-on drive:

39,140 232

RM05 Removable Disk Subsystem • 2048M bytes maximum subsystem storage; up to 8 drives of 256M bytes each; 38.3-millisecond average access time; 1.2M-byte-per-second peak transfer rate • connects to MASSBUS adapter.

RGM05-AA Subsystem • for VAX-11/750 • consists of MASSBUS adapter and single drive:

46,000 310

RGM05-BA Subsystem • for VAX-11/750 • consists of dual MASSBUS adapters and single drive:

60,000 415

REM05-AA Subsystem • for VAX-11/780 • consists of MASSBUS adapter and single drive:

46,000 326

REM05-BA Subsystem • for VAX-11/780 • consists of dual MASSBUS adapters and single drive:

60,600 415

RM05-AA Drive • 256M-byte single-access add-on drive:

34,000 252

RM05-BA Drive • 256M-byte dual-access add-on drive:

39,140 268

RM80 Fixed-Media Subsystem • 992M bytes maximum subsystem storage; up to 8 drives of 124M bytes each • 33.3-millisecond average access time; 1.2M-byte-per-second peak transfer rate • connects to MASSBUS adapter.

RGM80-AA Subsystem • for VAX-11/750 • consists of MASSBUS adapter and single drive:

31,900 131

RGM80-BA Subsystem • for VAX-11/750 • consists of dual MASSBUS adapters and single drive:

43,500 179

REM80-AA Subsystem • for VAX-11/780 • consists of MASSBUS adapter and single drive:

31,900 131

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REM80-BA Subsystem • for VAX-11/780 • consists of dual MASSBUS adapters and single drive:
43,500 179

RM80-AA Drive • 124M-byte single-access add-on drive:
19,900 100

RM80-BA Drive • 124M-byte dual-access add-on drive:
22,000 116

RP07 Fixed-Media Subsystem • 4128M bytes maximum subsystem storage; up to 8 Winchester-type drives of 516M bytes each • 31.3-millisecond average access time; 1.3M-/2.2M-byte-per-second peak transfer rate • connects to MASSBUS adapter.

REP07-AA Subsystem • for VAX-11/780 • consists of MASSBUS adapter and single drive:
50,000 240

REP07-BA Subsystem • for VAX-11/780 • consists of dual MASSBUS adapters and single drive:
64,600 320

RP07-AA Drive • 516M-byte single-access add-on drive:
38,000 180

RP07-BA Drive • 516M-byte dual-access add-on drive:
43,140 200

RP07-D Upgrade • provides 2.2M-byte-per-second transfer rate:
NA NA

☐ Tape

TE16 Magnetic Tape Subsystem • 9 tracks; program selectable 800/1600 bpi; 45 ips • consists of MASSBUS adapter, up to 8 TE16 tape units and up to 7 MASSBUS disk drives.

TEE16-AE Subsystem • for VAX-11/780 • consists of MASSBUS adapter and single tape unit:
$27,000 prch **$163 maint**

TGE16-AE Subsystem • for VAX-11/750 • consists of MASSBUS adapter and single tape unit:
27,000 155

TE16-AE Tape Unit • add-on tape unit:
15,900 97

TU77 Magnetic Tape Subsystem • 9 tracks; program selectable 800/1600 bpi; 125 ips • consists of MASSBUS adapter, up to 4 TU77 tape units and up to 7 MASSBUS disk drives.

TEU77-AB Subsystem • for VAX-11/780 • consists of MASSBUS adapter and single tape unit:
36,800 259

TGU77-AB Subsystem • for VAX-11/750 • consists of MASSBUS adapter and single tape unit:
36,800 259

TU77-AF Tape Unit • add-on tape unit:
23,800 193

TEU78-AB Magnetic Tape Subsystem • for VAX-11/780 • 9 tracks; program selectable 1600/6250 bpi; 125 ips; single access • consists of MASSBUS adapter, up to 4 TU78 tape units, and up to 7 additional MASSBUS disk drives and TU78 master tape units; each master tape unit controls additional add-on drive:
54,000 340

TEU78-BB Magnetic Tape Subsystem • same as TEU78-AB with dual MASSBUS adapters:
68,600 420

TU78-AB Master Drive • add-on tape unit:
48,000 280

TU78-AF Slave Drive • add-on tape transport:
25,500 170

TS11 Magnetic Tape Subsystem • 9 tracks; 1600 bpi; 45 ips • consists of UNIBUS adapter and tape unit • single subsystem per VAX-11 system.

TS11-CA Subsystem • for VAX-11/730 and VAX-11/750:
16,400 79

TS11-BA Subsystem • for VAX-11/780:
16,400 79

☐ Terminals/Workstations

Displays

VT100 • double-width, double-size character display; 80-character x 24-line, or 132-character x 14-line display; 19-key keypad; 95-character detachable ASCII keyboard; line-drawing graphic characters; smooth scrolling; split screen; composite video output • attaches via full-duplex asynchronous line; transmission speed of up to 19,200 bps.

VT100-AA • for video workstations and small business systems:
$2,150 prch **$18 maint**

VT100-WA • for DECmail applications:
2,345 21

VT1XX-AA • 20mA Current Loop Adapter:
140 4

VT1XX-AB • advanced video option providing BOLD, BLINK, UNDERLINE, and REVERSE VIDEO • adds 10 lines for 24-line x 132-column display:
180 4

VT101 • offers basic VT100 functionality plus local echo; allows connection to non-Digital computer systems:
2,150 15

VT102 • offers expanded functionality of VT100:
2,400 22

VT125 • enhanced VT100 with data plotting extensions • executes the Digital ReGIS (Remote Graphics Instruction Set):
3,800 29

VT1XX-CA • 20mA current loop adapter:
140 4

278-AA • minicomputer-based display for use with DECmate word processing systems • includes VT100 features, 64K bytes memory, and CPU:
6,595 48

VS11-AA • 16 color and monochrome raster graphics system; includes graphics instruction set, bit-slice architecture, switch-selectable resolution and intensity for image memory • basic configuration consists of an image processor, memory, synchronous generator, and joystick:
6,480 62

Teleprinters

LA34 • hard copy DECwriter IV; tabletop; EIA interface; otherwise same as LA38:
$1,450 prch **$18 maint**

LA38 • hard copy DECwriter IV; tabletop (G) or freestanding (H); variable horizontal tabs/margins; 4 character sizes; upper/lowercase keyboard; 6 line spacings; numeric keypad; maximum 30 cps; 300 bps.

LA38-GA • tabletop:
1,750 18

LA38-HA • freestanding:
1,850 18

LA100 • microprocessor-controlled receive-only terminal • used with VT100/VT125 terminal or host CPU:
2,800 25

LA120 • hard copy DECwriter III; freestanding; maximum 180 cps bidirectional; 9600 bps; 1K-character buffer; 7x7 dot matrix; selectable features include variable font sizes, tables, and form lengths:
2,800 32

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☐ Printers

LP11 Line Printers ● 204 to 900 lpm; all provide 132 columns; 64- or 96-character full-character impact printing ● each includes controller.

LP11-AA ● 285 lpm; 64-character:	$8,350 prch	$95 maint
LP11-BA ● 285/204 lpm; 64-/96-character:	8,950	95
LP11-CA ● 900 lpm; 64-character:	27,800	195
LP11-DA ● 660 lpm; 96-character:	29,700	195
LP11-YA ● 600 lpm; 64-character:	20,200	158
LP11-ZA ● 436 lpm; 96-character:	21,900	158

LP32 Line Printers ● 300 to 1200 lpm; all provide 132 columns; 64- or 96-character set ● attaches to DMF32 controller.

LP32-AA ● 300 lpm; 64-character:	26,280	166
LP32-BA ● 300/210 lpm; 64-/96-character:	26,280	166
LP32-EA ● 600 lpm; 64-character:	26,280	166
LP32-EB ● 600/450 lpm; 64-/96-character:	26,280	166
LP32-GA ● 1200 lpm; 64-character:	26,280	166
LP32-GB ● 1200/880 lpm; 64-/96-character:	26,280	166
LXY11 ● printer and plotter ● 132 columns; 96-character matrix; 300 lpm print; 170 lpm plot ● includes controller:	11,250	141
LXY21 ● printer and plotter ● 132 columns; 96-character matrix; 600 lpm print; 320 lpm plot ● includes controller:	15,800	163

☐ Card Equipment

CR11 Card Readers ● read 80-column cards at 300 or 600 cpm; includes control unit.

CR11(A) ● 300 cpm:	$8,250 prch	$74 maint
CR11-BC ● 600 cpm:	11,700	76
CME11-KA Card Reader ● 250 cpm; reads 40- and 80-column cards:	4,950	74

☐ Data Acquisition

LPA11-K DMA Controller ● for laboratory I/O devices; UNIBUS device:	$5,600 prch	$48 maint
LPA11-KK Sensor I/O Package ● includes LPA11-K DMA controller, ADK11-KT A/D converter subsystem, and DD11-CK backplane:	8,600	102
AA11-KT D/A Converter ● with distribution panel; supported on VAX UNIBUS without LPA11-K:	1,650	8
ADK11-KT A/D Converter ● includes KW11-K real-time clock; requires LPA11-K:	3,950	56
DR11-K General-Purpose Interface ● requires LPA11-K or KW11-K:	940	8
DR11-KT Package ● includes DR11-K and distribution panel ● requires LPA11-K and KW11-K:	1,360	8
AA11-K 12-bit D/A Converter ● 4-channel ● requires LPA11-K and KW11-K:	1,450	8
AD11-K 12-bit A/D Converter ● 16-channel single-ended 18-channel differential ● requires LPA11-K and KW11-K:	2,850	37
AM11-K Expander or Switch Gain Multiplexer ● 48-channel single-ended, 24-channel differential; for AD11-K or ADK11:	1,550	17
KW11-K Dual Programmable Real-Time Clock ● 1 16-bit clock and 1 8-bit clock:	1,150	20

● END

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